Cystic lesions and scrotal fluid collections in adults: Ultrasound findings

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KEYWORDS

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Abstract The widespread use of scrotal ultrasonography (US) has led to increased detection of testicular and extratesticular pathologies. Cystic or encapsulated fluid collections are relatively common benign lesions that usually present as palpable testicular lumps. Most cysts arise in the epididymis, but all anatomical structures of the scrotum can be the site of their origin. US may suggest a specific diagnosis for a wide variety of intrascrotal cystic and fluid lesions and appropriately guide therapeutic options. US should be used as an adjunctive diagnostic modality after clinical evaluation of a scrotal lesion associated or not with the presence of a lump.

Sommario La diffusione nella pratica clinica dell'ecografia ha determinato il riscontro sempre più frequente di lesioni delle struttura testicolari ed extratesticolari. Le cisti e le raccolte fluide incapsulate sono lesioni benigne di frequente osservazione e si manifestano come tumefazioni in genere non dolenti. La maggioranza delle cisti si localizza a livello dell'epididimo, ma tutte le strutture anatomiche dello scroto possono essere sede della loro origine. Gli ultrasuoni consentono in molti casi una diagnosi precisa e specifica, che non richiede ulteriori accertamenti diagnostici, ma solo una adeguata scelta terapeutica. L'ecografia deve essere impiegata come mezzo diagnostico che si aggiunge all'esplorazione clinica in tutti i casi in cui un processo espansivo viene palpato o meno.

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Introduction

After clinical examination, scrotal US is used as a first-line diagnostic tool in patients with symptomatic or

asymptomatic lesions. Fluid-filled lesions with more or less well-defined margins are the most frequently seen pathologies, and this group includes both true cysts and fluid collections (Table 1).

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Location of the lesion as well as the patient's age and symptoms are the basic elements for an anatomical and clinical classification of the lesion. Cystic lesions are diagnosed more rarely in children and adolescents than in adults and are usually of dysplastic or neoplastic origin.

Gray-scale US possibly associated with Color-Doppler US and contrast enhanced US (CEUS) usually provide an accurate diagnosis permitting a correct therapeutic management.

Cyst of the testis

Cysts of the testis are usually not palpable and are generally found incidentally during US examination due to other pathologies. They are most often single and rarely multiple. Usually they arise in connection with focal dilation of the seminiferous tubules due to malformation or as a result of an inflammatory episode. US diagnosis of simple cysts is based on the characteristic signs found in cysts located in other organs [1]: anechoic appearance, clear margins and posterior wall thickening (Fig. 1). Sometimes testicular cysts contain echoic material which is mobile when the patient moves or fixed (Fig. 2). If the material is mobile, the cyst is always benign; if it is fixed, the differential diagnosis should include cystic neoplasm [2].

Benign and malignant cystic tumors of the testicle are not frequent, but the most common is cystic teratoma [3] (Fig. 3). In these lesions CEUS [4] or magnetic resonance imaging (MRI) can solve diagnostic doubts related to the solid component.

Tubular ectasia of the rete testis

The rete testis is formed at the confluence of the seminiferous tubules and is located within the mediastinum testis where it extends to the testicular hilum. Obstruction of the ducts connecting the didymus and the epididymis may cause a progressive dilation of the rete testis which is bilateral in one third of patients [5]. The etiology is still not

Figure 1 Cyst of the testis. Anechoic didymal mass (arrow).

Figure 2 Cyst of the testis containing echoic material (arrow).

well established, but the highest incidence occurs in patients over 50 years of age and in prostatectomized patients, thereby suggesting that the lesion is caused by inflammation, often subclinical, which leads to obstruction of the tubules. The ectasia of the rete testis is often associated with spermatocele and cysts of the head of the epididymis suggesting that the pathogenesis is the same. At US examination, ectasia of the rete testis [6] can present a different appearance according to the progress of the process which can sometimes be limited to a few dilated tubules near the testicular hilum or appear as a network of small cysts occupying the central portion of the didymus (Fig. 4). Although ectasia of the rete testis is a benign lesion, it may cause oligospermia and azoospermia and consequent infertility [7].

Differential diagnosis should include both cystic dysplasia of the rete testis, which is most often seen in children and associated with urinary tract malformations [8], and varicose veins of the testicles which are easily diagnosed using color Doppler US (Fig. 5).

Albuginea cyst

These cysts are easily palpable, even if they are small; when they become larger they are painful and sometimes mistaken for tumors. They develop in the tunica albuginea and may be single or multiple; they are believed to arise from the mesothelial cells of the tunica itself [9].

Table 1 Cystic/liquid lesions of the scrotum in adults.

1. Testicular lesions
– Single or multiple cysts
– Ectasia of the rete testis
– Albuginea cysts
– Testicular abscess
– Post-traumatic cysts
2. Cysts of the epididymis
– Cyst of the head
– Tubular ectasia of the epididymis
– Spermatocele
– Cyst of the appendix testis and appendix epididymis
3. Spermatic cord cysts
– Congenital
– Acquired
– Pseudocysts
4. Hydrocele
– Idiopathic
– Post-traumatic
– Inflammatory

Figure 3 Cystic teratoma of the testis. Solid mass containing fluid collections (a); poor vascularization at color-Doppler US (b). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

At US examination albuginea cysts appear well-defined [10]; they develop in the virtual space of the vaginal cavity and cause signs of compression of the adjacent testicular parenchyma (Fig. 6). They rarely present a complex internal structure. In this case differential diagnosis should include tumor of the tunica albuginea such as sarcoma and mesothelioma. In cases of diagnostic doubt contrast enhanced MRI should be performed [11].

Figure 4 Tubular ectasia of the rete testis. US image shows a series of small cysts occupying part of the didymus.

Figure 5 Intratesticular varicocele. Note the presence of multiple anechoic structures within the didymus (a); color Doppler US shows the presence of vascular signals (b). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Testicular abscess

Testicular abscesses are rare as isolated clinical manifestations and are usually secondary to episodes of acute orchiepididymitis. At US examination the abscess appears as a fluid lesion [12], not completely anechoic, with blurred and ill-defined margins, surrounded by a hypoechoic halo of

Figure 6 Albuginea cyst. Anechoic formation within the tunica albuginea.

variable thickness (Fig. 7). The presence of particulate matter within the lesion produces hyper-reflective spots or the characteristic comet tail image in the presence of gas. Color Doppler US reveals peripheral hyperemia and CEUS shows an intense marginal absorption of contrast agent in the capillaries of the granulation tissue [13].

Cystic hematoma

Cystic hematoma occurs a few days after a traumatic event, when the blood clot undergoes colliquation. Initially the fluid collection presents a complex internal structure and ill-defined margins [14] and over time it degenerates into a liquid state presenting a clear demarcation compared to the surrounding parenchyma (Fig. 8). The lesion may

persist for several months and present aspects similar to those of a simple cyst. Color-Doppler US and CEUS can prove the avascular nature of the lesion.

Cyst of the epididymis

Cysts of the epididymis are the most common cystic lesions, and they are diagnosed in 20%–40% of asymptomatic patients undergoing US examination [15]. According to Holden et al. [16] they are even more frequent with an incidence of 75%. They are usually not palpable at clinical examination due to their small size and softness. They can be multiple and bilateral. From a structural point of view they may be true cysts as they are provided with epithelium cells containing a clear serous liquid and originate from the lymphatic ducts [17]. In other cases epididymary cysts may be caused by dilated tubules in response to inflammatory or congenital obstruction of the seminiferous tubules. These cysts may become quite large (5 cm in diameter) and develop in the vaginal cavity, in which case they are called spermatocele. Their content is usually corpuscular and dense, because it contains sperm, protein, white blood cells and cell exfoliation.

At US examination the cysts are usually located at the head of the epididymis and when they are small (2–4 mm in diameter) they may be completely transonic (Fig. 9). Larger cysts and particularly those originating from the seminiferous tubules of the epididymis may have internal septa and contain corpuscular material, which appears mobile and hyper-reflective at color Doppler US [18]. These are benign lesions which can grow slowly over time and reach large dimensions; they may require sclerotherapy or surgical excision. Cystic tumors of the epididymis are rare and diagnosis requires CEUS or MRI examination.

Tubular ectasia of the epididymis

In patients who have undergone vasectomy or surgical ligation of the vas deferens, a reticular dilation of the

Figure 7 Testicular abscess. Hypoechoic didymal mass with irregular margins (a). Color Doppler US shows peripheral hypervascularity and absence of signals within the lesion (b). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Figure 8 Hematoma of the testis. Voluminous cystic mass with internal septa in the didymus. The patient was receiving anticoagulant therapy and had suffered a direct blow a few days before.

Figure 9 Cyst of the epididymis. Anechoic lesion of the head of the epididymis.

entire epididymis and in particular of the body and tail can be seen after several years [19]. US appearance of this lesion is quite characteristic and is easily recognized [20]. The epididymis presents diffuse thickening with a finely and regularly reticulated appearance, and Color Doppler US shows small vessels arising from the deferential artery (Fig. 10).

Cyst of the appendix testis and appendix epididymis

The appendices of the testis and epididymis are residual cells from the ducts of Muller or mesonephric duct tissue. They are commonly found at autopsy [21], although US examination reveals their presence in only 6%–17% of patients [22]. They are clinically insignificant but may undergo torsion thereby causing intense pain that may prompt the patient to seek medical care and diagnostic investigation. Cysts of the didymus (Hydatid of Morgagni)

Figure 10 Tubular ectasia of the epididymis. Saccular dilatation of the epididymis with fine internal echoes.

Figure 11 Cyst of the epididymis. A small cystic mass adjacent to the head of the epididymis in a patient with hydrocele.

rarely present a cystic internal structure [23], but cysts of the head of the epididymis are usually cystic as they arise from residues of congenital tubular dilations [24]. After torsion of the pedicle, they can fall into the vaginal space and appear as small mobile cysts. They are easily identified in the presence of hydrocele [25] (Fig. 11).

Spermatic cord cyst

At clinical examination, palpation reveals this cyst as a tense, elastic mass located outside the testis and easily palpable along the course of the spermatic cord. It is easily identified at US examination which also establishes the extratesticular location [26] (Fig. 12).

The size of spermatic cord cysts may vary; sometimes they are very large and may caudally displace the didymus. They can be simple cysts or present an internal sediment structure, be multilocular and contain solid material. The origin of spermatic cord cysts has not been established, but these lesions are generally benign. They should be distinguished from cysts of the head of the epididymis as well as cystic cystadenoma which is probably of Mullerian origin. Spermatic cord cysts may arise as a result of incomplete obliteration of the peritoneal vaginal duct or residual coelomic epithelium. Cysts may occur as a result of chronic

Figure 12 Spermatic cord cyst. Cystic mass located along the course of the spermatic cord.

Figure 13 Bladder hernia. Presence of an anechoic mass in the inguinal canal, with wall appearance.

Figure 14 Hydrocele. Fluid collection in the scrotal sac (I). The testis (T) appears normal but posteriorly displaced.

pluri-concamerate hydrocele. Cases of benign or malignant tumors of the spermatic cord are rare, such as sarcomas which may sometimes present an internal cystic component. Diagnosis is usually easy due to the presence of a solid component, which is infiltrating and vascularized thus absorbing contrast agent at CEUS or MRI.

Pseudocyst of the spermatic cord

Inguinal bladder hernias [27] which develop in the scrotal sac and inguinal bowel hernias (Fig. 13) may simulate cystic lesions of the spermatic cord. Diagnosis is usually easy because these fluid containing lesions have a thick wall with a muscular structure and contain food in the intestinal hernia [28].

Hydrocele

Hydrocele is a more or less abundant fluid collection between the two layers of the tunica vaginalis with possible dorsal displacement of the didymus and epididymis [29]. Hydrocele is primitive when it is caused by an abnormal reabsorption of the fluid which is normally present in the tunica vaginalis, whereas it is secondary when it is the result of inflammation, trauma or tumors. Usually it appears as a testicular "mass" which is painless at palpation. US diagnosis is easy showing a fluid collection within the scrotal sac excluding injury of the testis [30] (Fig. 14). Chronic lesions may present small septa appearing like concamerations (Fig. 15). Sometimes, large hydroceles can cause impaired testicular blood flow thus mimicking torsion. In these cases aspiration of the fluid is required to restore normal blood circulation.

Some authors have described cases of mesothelioma of the testis which mimicked hydrocele [31].

Hydrocele caused by trauma, or hematocele, is an accumulation of blood within the tunica vaginalis. It is

Figure 15 Chronic hydrocele. Fluid collection in the scrotum with internal septa.

Figure 16 Hematocele. Corpuscular fluid (E) with a more echoic component (*) in a patient with scrotal trauma (T = testis).

a relatively common event in connection with scrotal trauma caused by inguinal surgery, but cases of hematocele have been described in association with spontaneous bleeding disorders and vasculitis. US appearance of

Figure 17 Pyocele. Scrotal fluid collection with internal echoes in a patient with acute epididymitis.

hematocele [32] varies according to the time of examination. In the acute phase, it appears as an echoic fluid collection, which becomes hypo-anechoic over time (Fig. 16). The image may also show fluid–fluid levels or internal echoes due to breakdown products of hemoglobin. Hydrocele caused by inflammation is also known as pyocele, which is most frequently seen as a result of epididymo-orchitis or inguinal surgery. At US examination the fluid collection is characterized by fine echoes or thick septa (Fig. 17).

Conclusions

US and color-Doppler US usually provide an adequate diagnosis of cystic lesions and fluid collections of the scrotum. However, when US diagnosis is uncertain, it is useful to perform contrast enhanced CEUS or MRI. The US operator should be familiar with normal and pathological US anatomy in order to make a correct diagnosis of these lesions.

Conflict of interest statement

The authors have no conflict of interest to declare.

Appendix. Supplementary material

Supplementary data related to this article can be found online at doi:10.1016/j.jus.2011.10.008.

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